Railway Crane
Maintenance Manual

Diesel Engine System 2.4

2.4.1 Diesel Engine

2.4.1.1 Diesel Engine (Different Types)
2.4.1.2 Diesel Engine (Crane wise list)

2.4.2 Exhaust System

2.4.3 Fuel System

2.4.4 Diesel Engine Accelerator

2.4.5 Pump Distributor Gearbox

Railway Crane
Maintenance Manual

Following two types of Diesel Engine has been fitted in 1986 Design 140T Crane:-

Type: - "A" - Diesel Engine

For Crane No.142032 to 1422043

Make	Cummins USA (Brazil)
Type	NT- 855 R4
Model	6-cylinders in series Water –cooled, Exhaust turbo charger
Output	224 kW at 1,800 rpm
Torque	1,158 Nm at 1,400 rpm
Generator	28 V 55 A

Type: - "B" - Diesel Engine

For Crane No.143001 to 143010

Make	CIL/PUNE
Type	NTA- 855 R-FFC
Model	6-cylinders in series Vertical Water –cooled, Exhaust turbo charger
Output	224 kW at 1,800 rpm
Torque	1,158 Nm at 1,400 rpm
Generator	28 V 55 A

Diesel Engine (Crane wise list) **2.4.1.2**

P-1/1

Crane wise Engine fitted: -

Crane Number	Crane Type	Type of Engine fitted
142032	Fully Imported	A
142033	Fully Imported	A
142034	Fully Imported	A
142035	Fully Imported	A
142036	Fully Imported	A
142037	Fully Imported	A
142038	Knock down	A
142039	Knock down	A
142040	Knock down	A
142041	Kit Crane	A
142042	Kit Crane	A
142043	Kit Crane	A
143001	Jamalpur Manufactured	B
143002	Jamalpur Manufactured	B
143003	Jamalpur Manufactured	B
143004	Jamalpur Manufactured	B
143005	Jamalpur Manufactured	B
143006	Jamalpur Manufactured	B
143007	Jamalpur Manufactured	B
143008	Jamalpur Manufactured	B
143009	Jamalpur Manufactured	B
143010	Jamalpur Manufactured	B

Railway Crane
Maintenance Manual

Description

The diesel engine drives the hydraulic pumps for travel and crane operations via the pump distributor gearbox.

The diesel engine supply the air pressure via the attached air compressor to the air pressure system, the batteries with power via the attached 3 phase generator Out-put 24V DC and thus also the electrical equipment with power.

Two Types of diesel engine has been fitted in 1986 Design 140T Crane. The types are given in **Section – 2.4.1.1** and Crane wise engine fitted is given in **Section – 2.4.1.2.**

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab. Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed, or squashed!
Observe safety and disposal regulations for the respective product when dealing with oil and fuel.
No smoking, no naked flame or light, sparks or glowing ashes near the fuel or diesel engine system-Danger of explosion and fire!
Use caution when dealing with oil-danger of being burnt or scalded!

Caution- *Hydraulic system work may only be performed on the hydraulic system when there is no pressure and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.*
Use caution when releasing connections because higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Caution*- air pressure system! Work may only be performed on the air pressure system when the diesel engine is not running and the entire air pressure system is without pressure. This is also applicable for the tightening of the air pressure connections.*
Caution*- sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill!*
Ensure that no one is in the danger zone.
Observe the safety instructions provided in the Cummins User's Manual.

Maintenance Instructions

The following maintenance work on the diesel engine system is to be carried out according to the information in the Cummins User's Manual:
Please note: All the maintenance work listed in the interval before hand must be carried out as well.

Check the oil level; if required top up oil using the brand as classified in the chart in **Section- 3** of this manual.
Oil Changing: -
Filter Changing: -

Check the coolant level, if required, top up coolant using the brand as classified in the chart in **Section- 3** of this manual. In this case, the coolant concentration must be checked.

Check the fan belt condition and tension; if required, readjust tension.

Monthly or every 125 hours: Change oil.
Note: The interval for changing the oil must be determined based on the Cummins User's Manual and the operating data recorded, i.e. Average fuel and oil consumption or after an oil analysis.

for oil drain plug.

- Change fuel filter elements.
- Clean or change crank house ventilation.
- Change DCA coolant filter.

Semi-yearly or every 750 hours: Change oil filter elements
Note: The interval for changing the oil must be determined based on the Cummins User's Manual and the operating data recorded, i.e., average fuel and oil consumption or after an oil analysis.

for oil drain plug.

- Change air compressor filter elements.

Railway Crane
Maintenance Manual

Description

The exhaust system emits the exhaust fumes into air, reduces the emission speed of the exhaust and silence the noise level of the diesel engine. The system consists of manifold, compensator, and silencer.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed, or squashed!
Observe safety and disposal regulations for the respective product when dealing with oil and fuel.
No smoking, no naked flame or light, sparks or glowing ashes near the fuel or diesel engine system-Danger of explosion and fire!
Ensure that no one is in the danger zone.

Maintenance Instructions

Check the exhaust system, its connections and mountings elements for external damage and firm seating.

Railway Crane
Maintenance Manual

Description

The fuel system supply the fuel required to operate the diesel engine. The fuel capacity is 1000 litres. The system is fitted with an electric indicator for fuel level.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed, or squashed!
Observe safety and disposal regulations for the respective product when dealing with oil and fuel.
No smoking, no naked flame or light, sparks or glowing ashes near the fuel or diesel engine system-Danger of explosion and fire!
Use caution when releasing connections because higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Ensure that no one is in the danger zone.

Maintenance Instructions

Check the fuel system, its pipe and hoses connections for external damage, firm seating and. Any damaged fuel lines must be replaced immediately. Also check the connections on the electric indicator for firm seating.

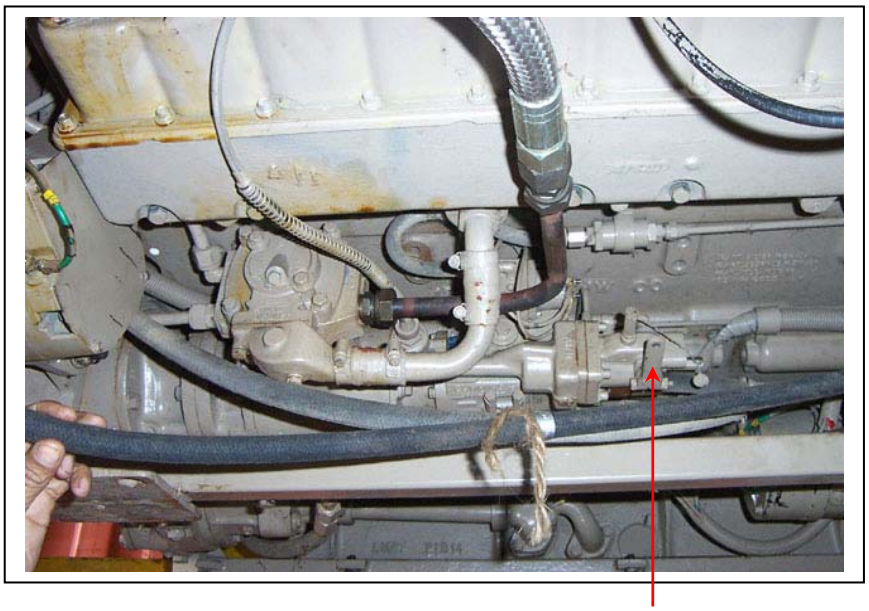
The tank has a filler neck on the superstructure. Check the tank cover for proper functioning. A faulty tank cover must be replaced.

To avoid corrosion damage, drain the condensation via the drain plug on the tank under side. To do so, open the plug until clean diesel fuel emerges. When re-closing, ensure the seal is seated properly! For details, use Cummins user's manual.

Railway Crane
Maintenance Manual

Diesel Engine Accelerator **2.4.4**

P-1/1



Accelerator lever

Description

The accelerator controls the injection pump of the engine. The accelerator is operated via a Bowden cable by means of a pedal in the cab.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed, or squashed!
Observe safety and disposal regulations for the respective product when dealing with oil and fuel.
No smoking, no naked flame or light, sparks or glowing ashes near the fuel or diesel engine system-Danger of explosion and fire!
Use caution when releasing connections because higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Ensure that no one is in the danger zone.
Observe the safety instructions provided in the Cummins User's Manual.

Maintenance Instructions

Check the accelerator and the pertaining linkage including Bowden cable for external damage and firm seating.

Start the diesel engine for the functional test and operate the gas pedal in the cab. Check whether the diesel engine runs evenly in the various speed ranges.

Railway Crane
Maintenance Manual

Description

The pump distributor gearbox (PTO) is mounted on the diesel engine through centa max coupling and transfers the drive output of the diesel engine to the pumps flanged-mounted on the gearbox. The pump distributor gearbox is a spur gear seated on a roller bearing and fitted with an oil bath lubrication system.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed, or squashed!
Observe safety and disposal regulations for the respective product when dealing with oil and fuel.
No smoking, no naked flame or light, sparks or glowing ashes near the fuel or diesel engine system-Danger of explosion and fire!
Use caution when dealing with hot oil- danger of being burnt or scalded!

Maintenance Instructions

The following maintenance work on the diesel engine system must be carried out according to the information in the Lohmann and Stolterfoht User's Manual.

Check the pump distributor gearbox, in particular, near the flange connection for external damage, leakages, and firm seating.

Note: To check the oil level of the distributor box, the railway crane must be in horizontal position. Switch off the engine when it has reached operating temperature and wait approx. 10 minutes to check the oil level.

- Pull out the oil dipstick of the pump distributor gearbox.
- The oil level must be between the upper and lower markings of the dipstick; if required top up oil using the brand as classified in the chart in **Section -3** of this manual.

Note: Add or top up oil via the filler opening, the plug of which is screwed out for this purpose. The screw in the plug and tighten.

An oil analysis should be carried out every 750 operating hours to test the oil quality. If required, adjust the oil changing intervals.

- Flush the gearbox with flushing oil.

Note: To change the oil of the distributor gearbox, the crane must be in horizontal position. Switch off the engine when it has reached operating temperature and wait approx 10 minutes to check the oil level.

- To drain the oil, screw out the oil drain plug on the gearbox under side and collect the waste oil in a suitable and sufficiently large enough pan.

- Clean the magnet plug on the oil drain plug, screw in, and tighten according to regulations.
- To carry out an oil analysis: if there is considerable metal abrasion in the oil or the drain plug, this means that there is high degree of wear or considerable gearbox damage. If required, consider a gearbox inspection.
- Top up oil as per the classification in the chart until the upper marking on the dipstick is reached.
- To add or top up on, observe the information in the section on the oil level check.

Check the vent filter on the housing upper side; if required, clean or replace.

Check the screw-on connection for firm seating, taking into account the torque on the installation drawing.

Railway Crane
Maintenance Manual

Emergency Diesel Engine System 2.5

2.5.1 Emergency Diesel Engine

2.5.1.1 Emergency Diesel Engine (Different Types)
2.5.1.2 Emergency Diesel Engine (Crane wise list)

Emergency Diesel Engine (Different Types) 2.5.1.1

Following two types of Emergency Diesel Engine has been fitted in 1986 Design 140T Crane:-

Type: - "A" - Emergency Diesel Engine

For Crane No.142032 to 1422043

Type	SCHULE- TAF 2
Model	2-Cylinder in series Vertical Air -cooled
Output	10.5 kW at 1800 rpm

Type: - "B" - Emergency Diesel Engine

For Crane No.143001 to 143010

Type	KIRLOSKAR- TA 2
Model	2-Cylinder in series Vertical Air -cooled
Output	10.5 kW at 1800rpm

Railway Crane
Maintenance Manual

Crane wise Emergency Engine fitted: -

Crane Number	Crane Type	Type of Engine fitted
142032	Fully Imported	A
142033	Fully Imported	A
142034	Fully Imported	A
142035	Fully Imported	A
142036	Fully Imported	A
142037	Fully Imported	A
142038	Knock down	A
142039	Knock down	A
142040	Knock down	A
142041	Kit Crane	A
142042	Kit Crane	A
142043	Kit Crane	A
143001	Jamalpur Manufactured	B
143002	Jamalpur Manufactured	B
143003	Jamalpur Manufactured	B
143004	Jamalpur Manufactured	B
143005	Jamalpur Manufactured	B
143006	Jamalpur Manufactured	B
143007	Jamalpur Manufactured	B
143008	Jamalpur Manufactured	B
143009	Jamalpur Manufactured	B
143010	Jamalpur Manufactured	B

Railway Crane
Maintenance Manual

Description

The emergency diesel engine drives a hydraulic pump in emergency operation**. (See Figure 'A'** Two types of emergency engine has been fitted in 1986 design cranes of Gottwald & Jamalpur make. The brief specification is given in **Section -2.5.1.1** and Crane wise emergency engine fitted is given in **Section -2.5.1.2.**

SAFETY INSTRUCTIONS

Caution*- fuel is inflammable! When working near fuel related parts, fire, naked light, and smoking are prohibited!*
Caution- *Lubrication oil, etc. are drained at operating temperature- danger of scalding!*
Caution*- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure and the diesel engine is stationary. This also applies to the tightening of hydraulic connections.*
Use caution when releasing connection because higher mounted components could drain dry. In these cases, ensure an adequately sized drip pan is available.
Observe disposal regulations!
Caution- *air pressure system! Work may only be performed on the air pressure system when the diesel engine is not running and the entire air pressure system is without pressure. This is also applicable for the tightening of the air pressure connections.*
Caution!- *sections of the air pressure systems are under pressure until the accumulators have been emptied.*
Prior to commencing work, remove the battery main switch. In addition, a "Maintenance Work" warning sign must be affixed here and in the cab. When work is being performed in the cab, ensure that the switches and levers are not operated by accident or unknowingly.
Ensure that no one is in the danger zone.
Observe the safety regulations in the SCHULE / Kirloskar User's Manual.

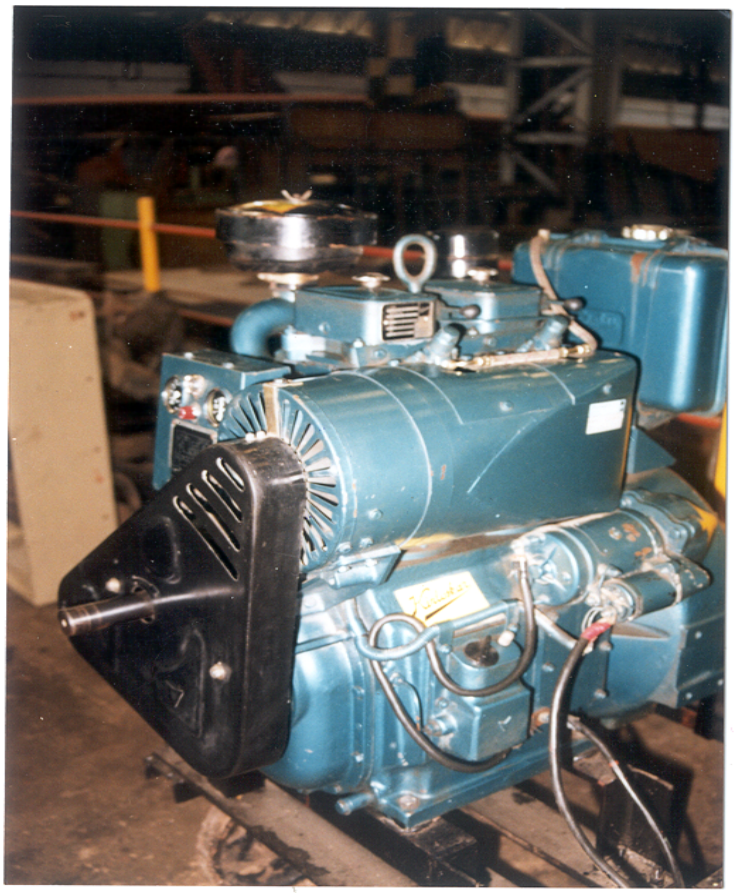
Maintenance Instructions

The following maintenance work on the diesel engine must be carried out according to the information provided in the Kirloskar User's Manual.
Check the emergency diesel engine, its attachments, and connections for external damage and leakages. Check all connections and lines for firm seating.

Note: To check the oil level, the crane must be in horizontal position. The oil should be changed when the oil is at operating temperature.

- Switch off the engine when it has reached operating temperature and wait until the oil has run back into the oil tray.
- To check the oil level, pull out the oil dipstick and wipe off with a clean, lint-free rag. Then insert the oil dipstick and pull out again. The oil level must be between upper and lower markings of the dipstick If required, top up with oil using the brand as classified in the chart in section 6 of this manual.
- Switch off engine and Screw out the oil drain plug on the bath and drain the waste oil into a sufficiently large enough collection tray (approx. 4.5 ltrs). Then screw in the drain plug with a new seal tightly.
- Then top up oil via oil filler neck using the brand as classified in the chart in **Section- 3** of this manual until the oil level is between upper and lower markings on the dipstick.
- Clean the different types of filter as per SCHULE / Kirloskar maintenance manual.

Figure 'A'



Railway Crane
Maintenance Manual

Travel and Running Gear 2.6

2.6.1 Travel Reduction Gear Unit

2.6.2 Pinion and Gear wheel

2.6.3 Disengaging Devices

2.6.4 Wheel Sets

2.6.5 Wheel Set Bearings

2.6.6 Spring Suspension

2.6.7 Expander-operated Brake Discs

2.6.8 Brake Cylinder Adjuster Units

2.6.9 Brake System

Railway Crane
Maintenance Manual

Description

The travel gear reduction unit reduces the drive speed of the hydraulic motor to the required pinion speed. The crane has a total of two travel drives and thus two travel gear reduction units.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment.
Caution*- When dealing with hot oil- Danger of being burnt or scalded!*
Caution*- Hydraulic system! Work may only be performed on the hydraulic system when there is no pressure and the diesel engine is stationary. This also applies to the tightening of hydraulic connections. Use caution when releasing connections because higher mounted components could drain dry. In these Observe disposal regulations!*
Caution*! – Some sections of the hydraulic and air pressure systems are still under pressure even when the crane is at a standstill.*

Maintenance Instructions

Check the travel gear reduction units for external damage, leakages, and firm seating.
Note: To check the oil level, bring the railway crane into horizontal position and switch off the engine at operating temperature.

- The oil level is checked via an overflow gauge.
- To do so, clean the exterior of the oil filler plug **(See Figure 'A' on the bottom left)** and screw out.
- If required, add oil until the oil level remains constant.
- Screw in the oil filler plug and tighten.

To change the oil, the railway crane must be in a horizontal position and switch off the engine at operating temperature.

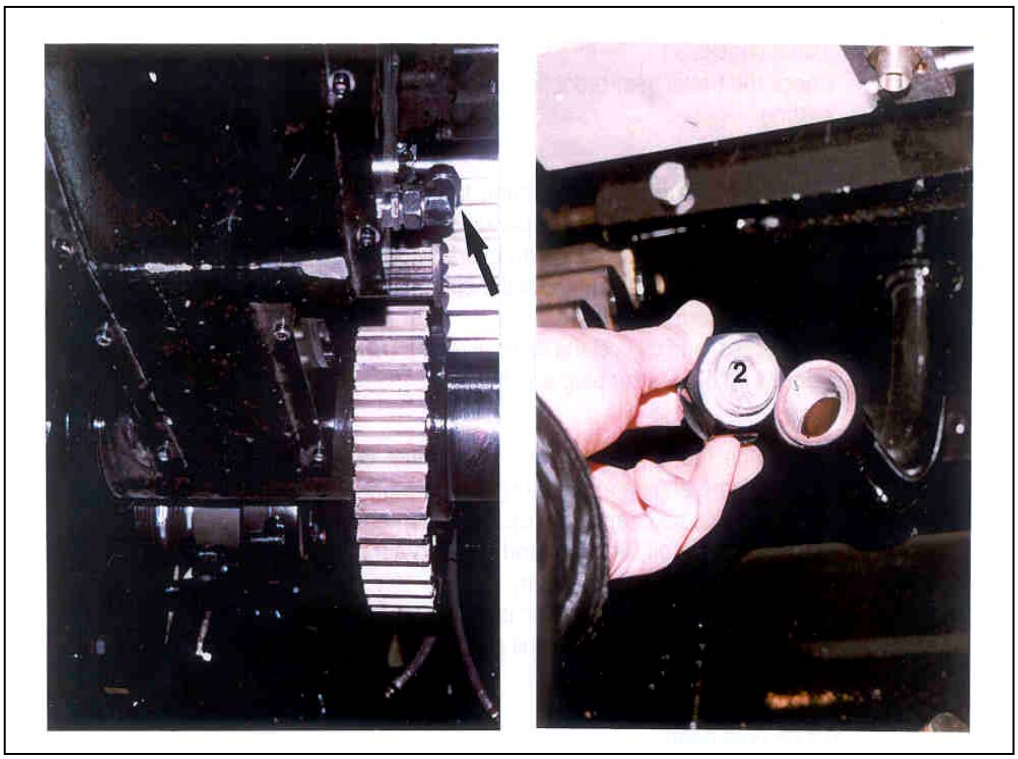
- The oil must be changed at operating temperature.
- Screw out the oil filler plug and the oil drain plugs **(See Figure 'B' at the top item-1**) and drain the oil completely.
- Check drained oil for metallic pollution and excessive abrasion.
- In the event of considerable oil pollution the gear unit must be filled with preheated oil.
- Then tighten the oil drain plug using a new sealing ring.
- Add oil until the oil level remains constant.
- Screw in the oil filter plug and tighten.

To check the vent:

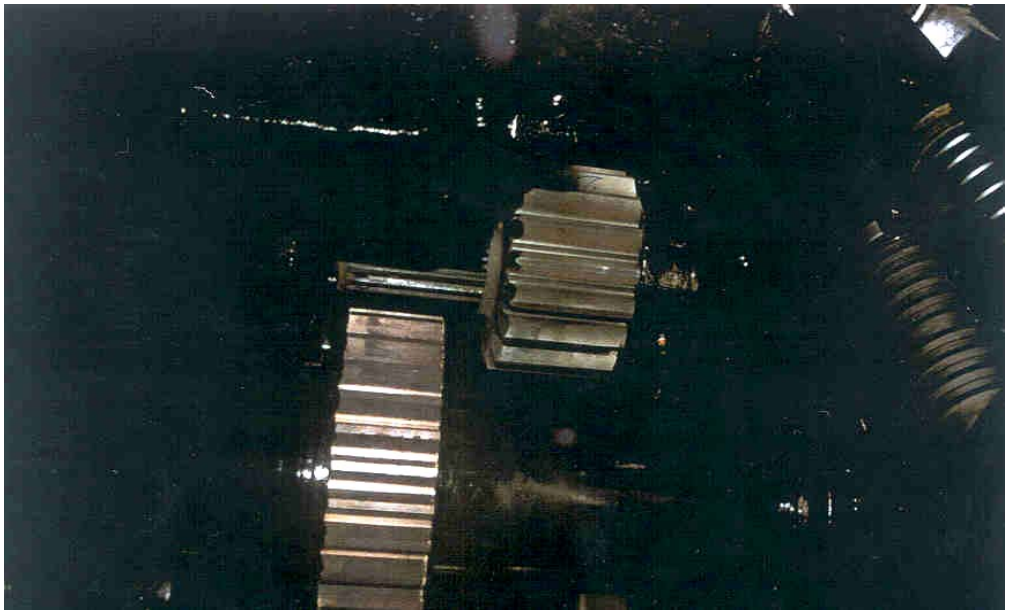
- If the vent is seriously closed, screw out the vent (**See Figure 'C' on the bottom right item-2**) from the gear unit, wash in a suitable solution and dry with compressed air.

Figure 'A'

Figure 'B' & 'C'



Railway Crane
Maintenance Manual



Description

The pinion and gear wheel on the wheel shafts forms the last stage of the disengaging travel gear drive. The crane has a total of two travel drives and thus two pinion and gear wheels.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment.
***Caution-** When dealing with hot oil- Danger of being burnt or scalded!*
Observe disposal regulations!

Maintenance Instructions

Check the pinions and gear wheel for external damage.

Clean the pinion and gear wheels with a suitable aid.

Caution- Grease using the lubrication brand as per the chart in the **Section -3** of this manual.

Railway Crane
Maintenance Manual

Description

By means of the disengaging device, the pinion and the gear wheel of the travel drive are disengaged prior to transport. The disengaging device is attached via an air pressure cylinder. The crane has a total of two travel drives and thus two disengaging devices **(See Figure 'A')**.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.

In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment.
***Caution**- When dealing with hot oil- Danger of being burnt or scalded!*
Observe disposal regulations!
***Caution-** Some sections of the system are under pressure until the accumulators have been emptied.*
Prior to commencing work on the air pressure system, ensure the system is completely without pressure!
Use caution when dealing with air pressure system! Work may only be performed on the air pressure system is without pressure. This is also applicable for the tightening of the air pressure connections.

Maintenance Instructions

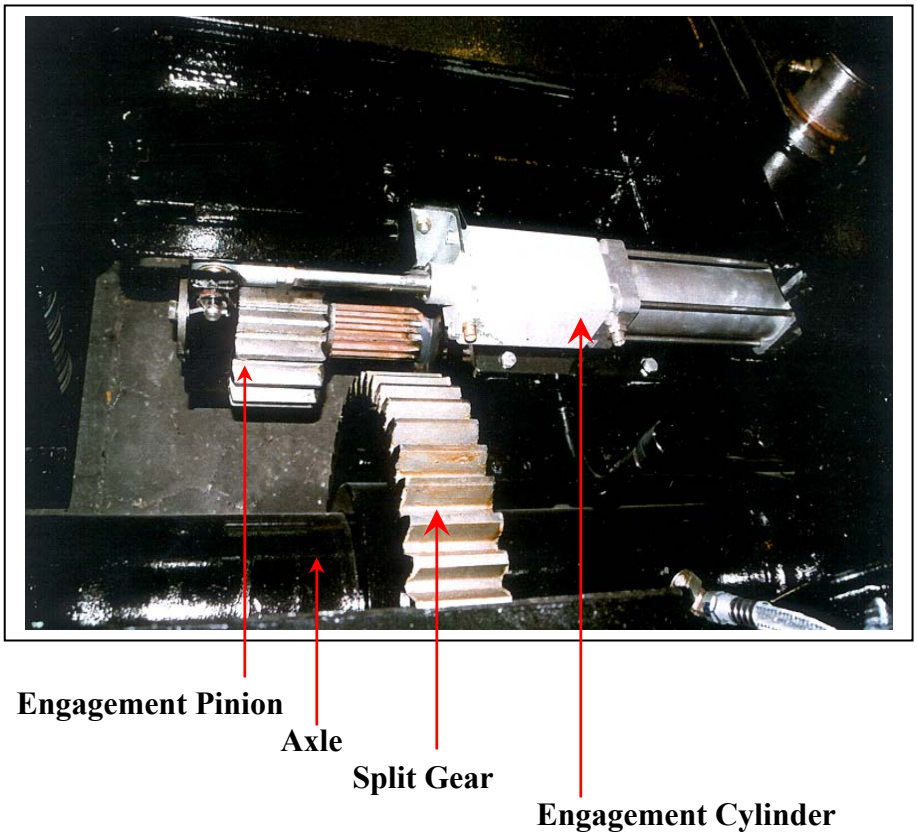
Check the disengaging devices, their connections, and mountings for external damage and firm seating.

- Check the air pressure cylinders, their connections, and mountings for external damage, firm seating, and proper sealing.
- Tighten and replace loose and leaky connections when the system is not under pressure.
- On completion of the maintenance work, a sealing test under pressure must be carried out.

The spline shaft teething for dirt: - if required, clean, then grease.

Check the disengaging devices for proper functioning.

Figure 'A'



Railway Crane
Maintenance Manual

Description

The six wheel sets are specially manufactured sets, which are suited to absorbing all the forces and stresses which occur during crane and travel operation **(See Figure 'A' & 'B').**

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment.
Caution*- when dealing with hot oil- Danger of being burnt or scalded!*
Observe disposal regulations!

Maintenance Instruction

The following maintenance work on the wheel sets must be carried out according to the information in the Gutehoffnungshutte Radsatz GmbH User's Manual.

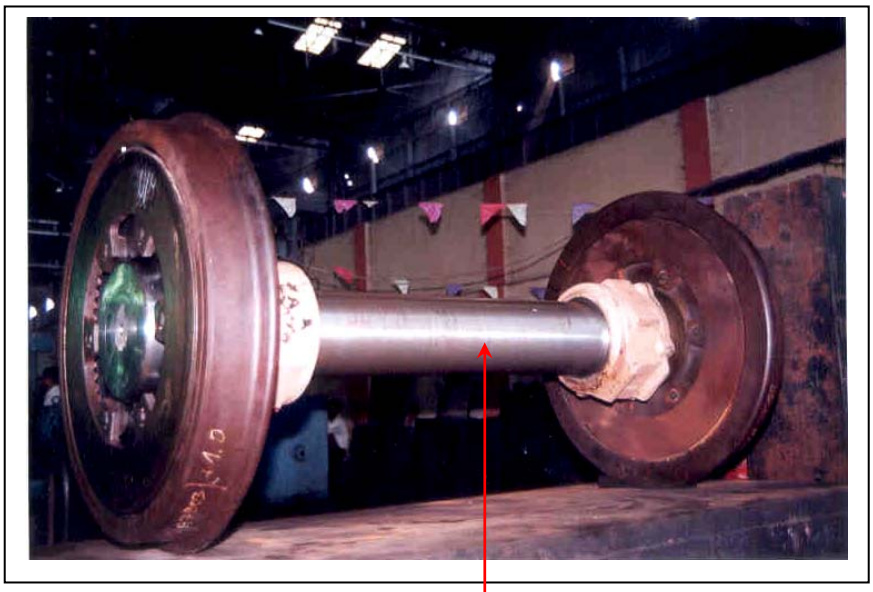
Check the wheel sets for cracks, fractures, and damage. Watch for the following features. If required, repair or replace:

- Cracks in the hub or disk of the solid wheels
- Indicating groove on the solid wheels is no longer visible on the circumference.
- Shape and location of the wheel contours.
- Surface finish of wheel treads
- Broken or cracked wheel rims on the solid wheels
- Wheel flats on the wheel tread
- Heat cracks in the disk wheels
- Clamping nicks on the solid wheels
- Spalling on the wheel treads
- Wheel shift
- Cracks in the wheel axle
- Deformed wheel axle
- Heavy rusting on axles and disk wheels

Check the mountings of the brake discs for proper and firm seating.
Wheel Back to back distance:
The wheel back to back distance (crane unloaded) 1596 mm + _2 mm.

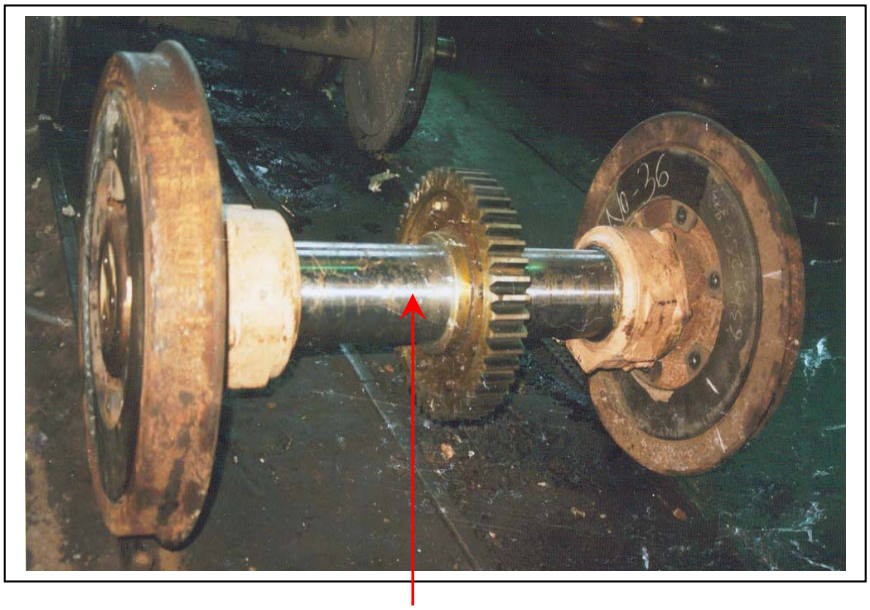
Wear Test/ Operating limit size:
Diameter, N**ew** 915 mm, +_ 1 mm
Diameter**, Min**: 860 mm

Figure 'A'



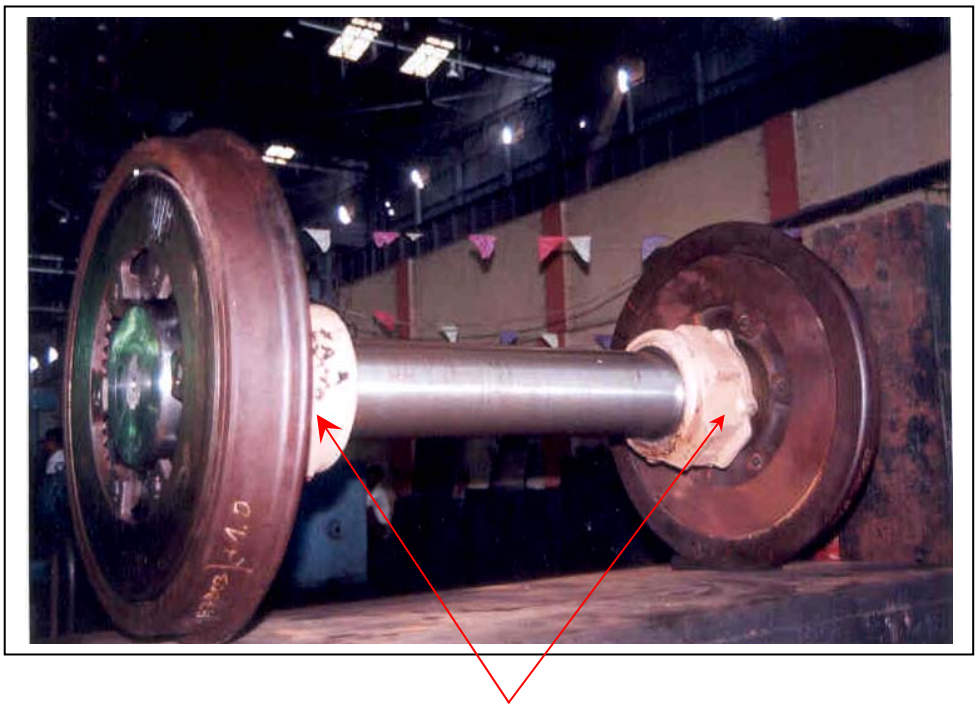
Non-driving

Figure 'B'



Driving

Railway Crane
Maintenance Manual



Wheel set bearings

Description

The wheel set bearings are anti-friction bearings with a grease filling.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment.
***Caution**- When dealing with hot oil- Danger of being burnt or scalded!*
Observe disposal regulations!

Maintenance Instructions
Check the wheel set bearings and their guides for external damage.

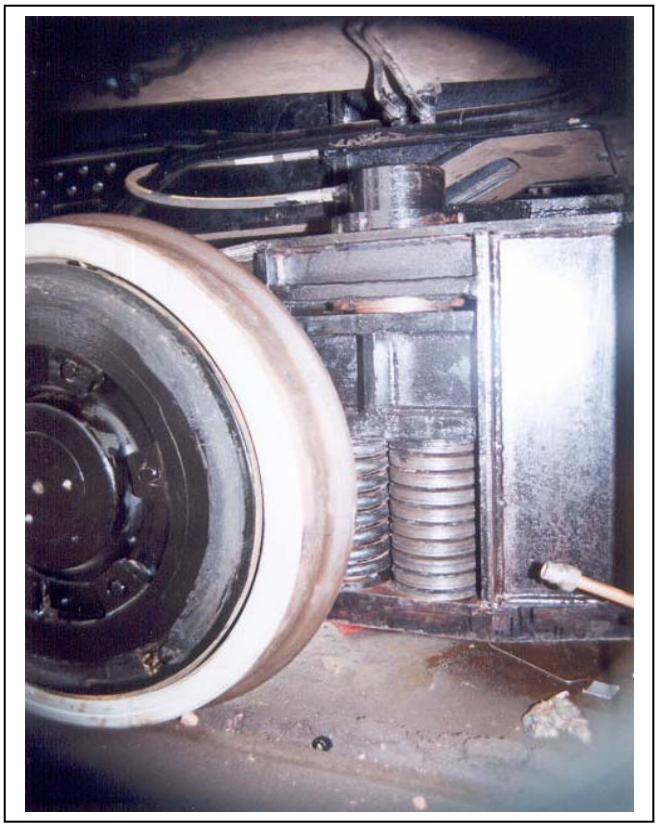
The bearings have grease filling. To replace the filling, open the bearing and remove the bearing housing. Then clean the entire anti-friction bearing and the housing and filled with fresh grease, Re-assembly in reverse order.

Note: The inner bearings should not be opened.

Railway Crane
Maintenance Manual

Spring Suspension **2.6.6**

P-1/1



Description

To provide optimal suspension, the crane is fitted with a spring system. The system consists of combinations of cup spring and the helical springs. In crane operation, the spring suspension clearance is blocked during crane operation by means of hydraulic cylinders.

SAFETY INSTRUCTIONS

! Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.

In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.

Remove ignition key and battery main switch and secure against any unauthorised start.

The crane must not be in the way of other vehicles.

Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment.

Caution- When dealing with hot oil- Danger of being burnt or scalded!

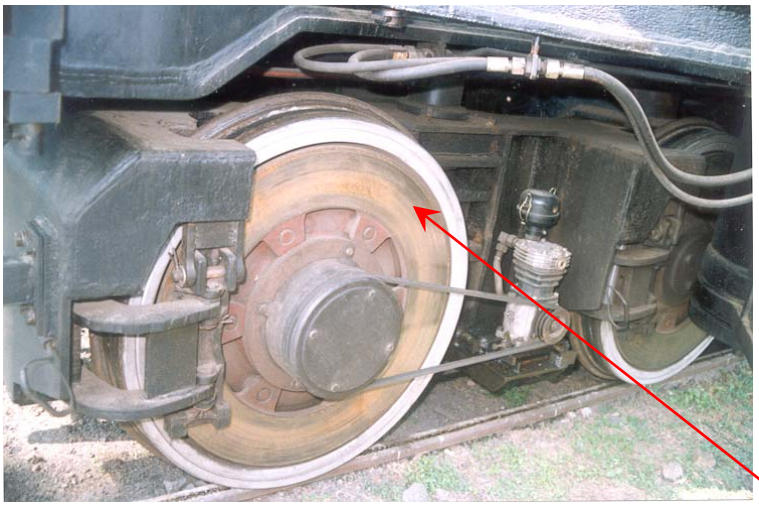
Observe disposal regulations!

Maintenance Instructions

Check the components of the spring assembly for external damage as well as for cracks and fractures. Any damaged spring elements must be replaced immediately.

If required, clean spring suspension with a suitable aid.

Railway Crane
Maintenance Manual



Description

The brake discs in connections the brake cylinder adjuster unit and the brake cylinder forms the wheel disc brakes. These wheel brake discs are used as the service brakes. The brake discs are mounted on the wheels of the wheel set axles.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
***Caution-** The brake discs must be cooled down- Danger of injury through burns as a result of contact with the brake discs!*
When the following work is performed on the brake discs, observe the safety instructions in the BSI Verkehrstechnik User's Manual.
The brake discs may first be used again when all the criteria in the BSI-Verkehrstechnik User's Manual have been met.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

The following maintenance work on the brake disc must be carried out in accordance with the instructions in the BSI- Verkehrstechnik User's Manual.
* Check the brake discs for external damage, cracks, (great thermal shock cracks) and fractures:
* In addition, when the wear markings on the discs have been reached, check the pads and the clearance.

Wear markings:

Disk wear limit:		max. 7.0 mm
Hollow wear	:	max. 2.5 mm
Grooves	:	max. 1 mm

Carry out a functional test (brake test)

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Description

The brake cylinder adjuster unit, together with the built-in brake cylinder, forms in connection with the wheel-mounted brake disc, the wheel disc brake of the railway crane **(See Figure 'A').** This brake is used as the service brake.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
***Caution**- The brake discs must be cooled down- Danger of injury through burns as a result of contact with the brake discs!*
When the following work is performed on the brake discs, observe the safety instructions in the BSI Verkehrstechnik User's Manual.
The brake discs may first be used again when all the criteria in the BSI-Verkehrstechnik User's Manual have been met.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

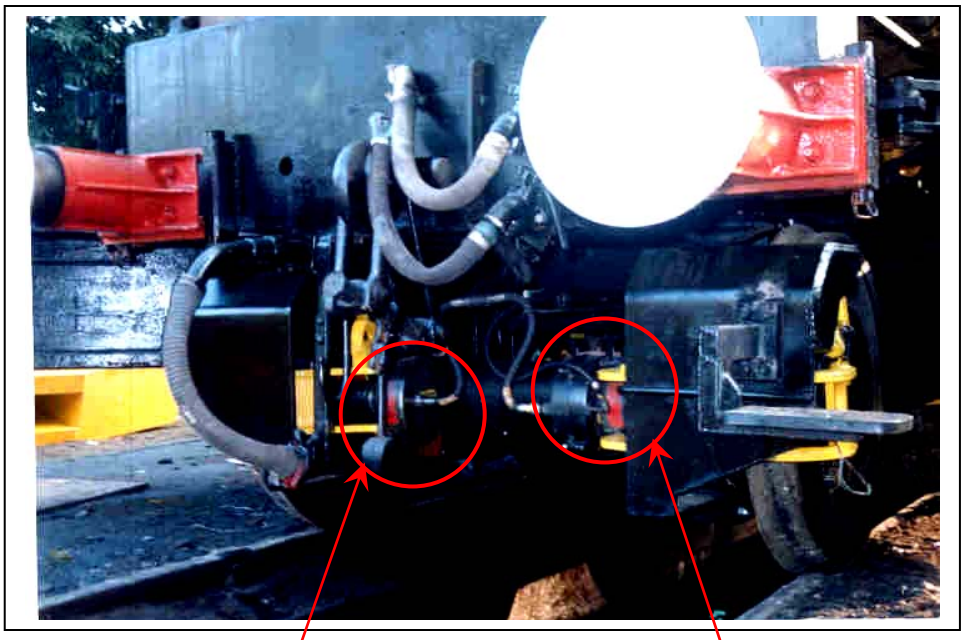
The following maintenance work on the brake disc must be carried out in accordance with the instructions in the BSI- Verkehrstechnik User's Manual.

- Check the brake cylinder, adjust units for external damage.
- In addition, check the clearance when the wear markings on the pads have been reached.

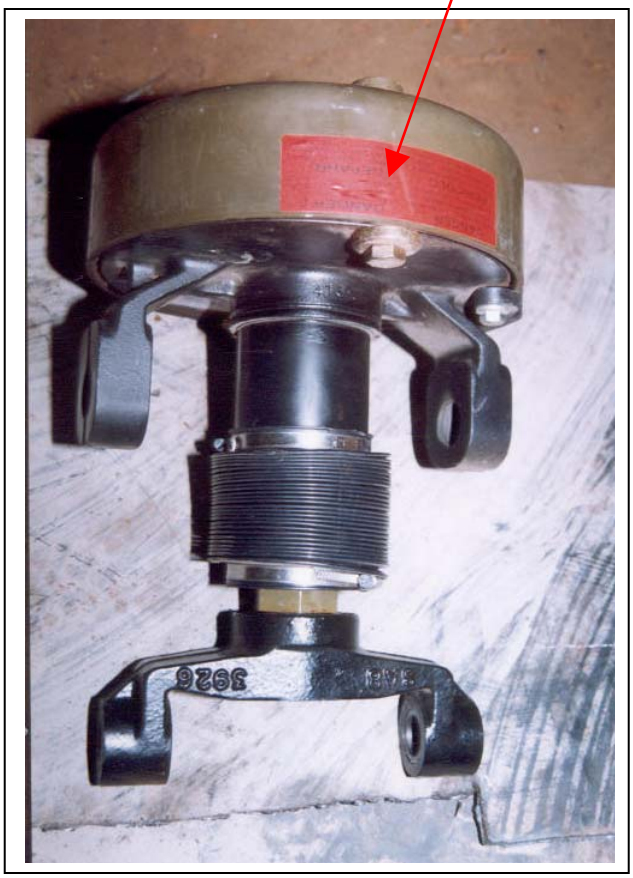
- Wear markings (Brake Pads):
  New Condition : 24 mm
  Wear limit : 6 mm
- Longitudinal clearance of the pad holder: max. 2 mm
- Clearance for the brake pads and brake discs

- Pads on the expander unit: max. 2 mm
- Pads on the other side: max. 4 mm

Figure 'A'



Brake Cylinder Adjuster Unit



Railway Crane
Maintenance Manual

Description

The crane can either be operated by means of an air pressure brake system or a vacuum brake system. The brake system can be changed from the air pressure system to the vacuum system and vice versa by means of two levers which can be operated on both sides of the crane **(See Figure 'A').**
The status of the brakes can be read off the respective indicators (red and green).
If required, the spring-loaded cylinders of the brakes can be relieved of pressure by means of the Bowden cables.
Caution! In this case, braking cannot be carried out again until the brake system has been re-pressurised with air pressure.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance Work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
***Caution-** The brake discs must be cooled down- Danger of injury through burns as a result of contact with the brake discs!*
When the following work is performed on the brake discs, observe the safety instructions in the BSI Verkehrstechnik User's Manual.
The brake discs may first be used again when all the criteria in the BSI-Verkehrstechnik User's Manual have been met.
Ensure that no one is near hot or moving parts- danger of getting burnt, crushed or drawn into the equipment!

Maintenance Instructions

Check all the components of the brake system, in particular the change- over devices and the Bowden cables as well as their pertaining mountings for external damage and firm seating. Also check the indicators for firm seating.

Clean the change- over devices and the Bowden cables.

Check the six pull cables of the emergency release device for proper functioning.

Carry out a functional test on the entire brake system. The brake must be operated and then released. Observe the indicators during this procedure

Figure 'A'

Railway Crane
Maintenance Manual

Cab **2.7**

2.7.1 Cab

2.7.2 Control Panels

2.7.3 Screen Wiper /Wash System

2.7.4 Fan

2.7.5 Additional Equipment

Railway Crane
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Description

The cab protects the operating personnel and the sensitive controls against the influences of weather **(See Figure 'A').**

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts-danger of getting burnt, crushed or drawn into the equipment!
When working with paint and solvents, ensure to observe without with out fail the respective safety instructions on the packages.
When dressing with a flame- use caution- danger of explosion near fuel and oil related components!
When work is being performed on the crane, ensure that the switches and levers cannot be operated by accident or unknowingly.
Ensure that no one is in the danger Zone.

Maintenance instructions

Check the entire cab for external damage and deformations.
Caution: Check material before commencing with straightening work! In some cases, the cab has aluminium profile, which must not be heated by flame.

Check the glass for damage. Any damaged panels must be replaced immediately.

Clean the cab width a suitable aid. This applies, in particular to the walkways and stair areas; oily and greasy components increase the danger of slipping!

Clean, grease and check the hinges and door lock for proper functioning.

Clean the paintwork damage immediately and protect against corrosion with primer and paint.

Figure 'A'

Control Panels 2.7.2

Description

By means of the control panels, all crane and travel motions can be affected and most functions can be monitored.

SAFETY INSTRUCTIONS

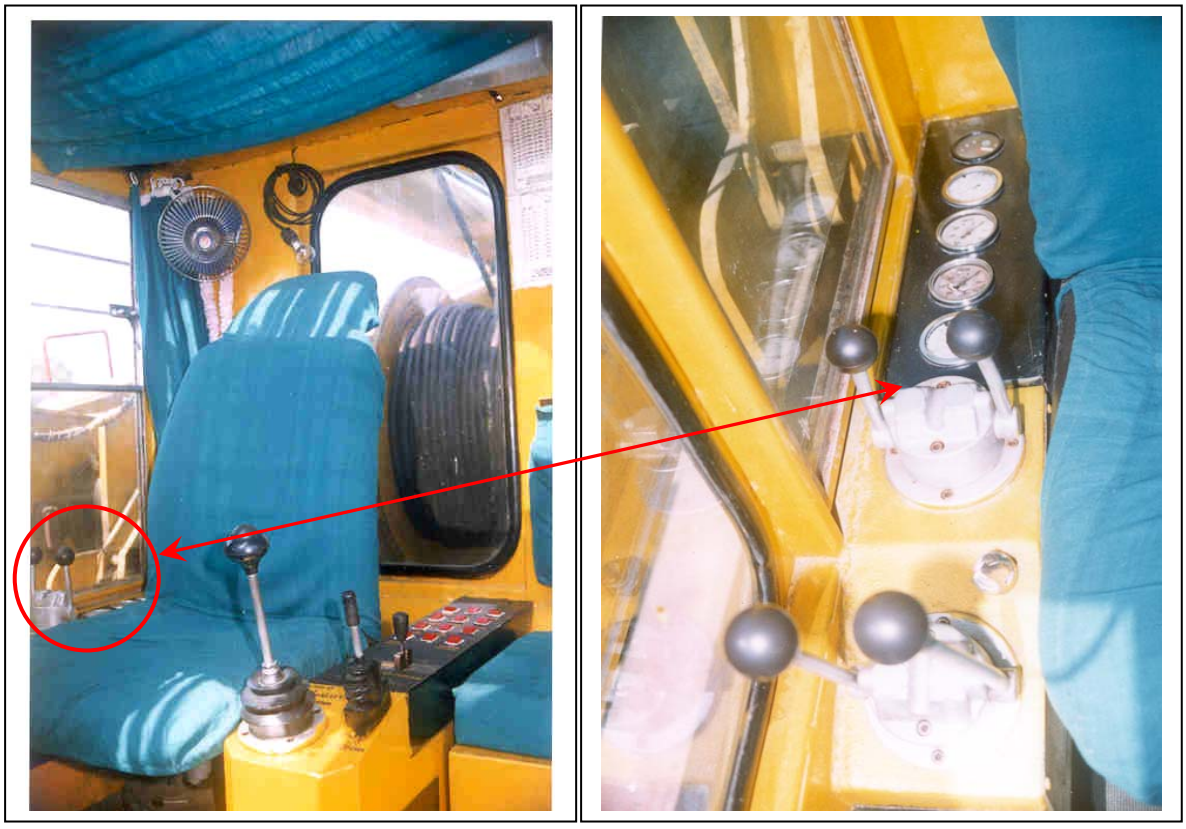
Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts-danger of getting burnt, crushed or drawn into the equipment!
When working with paint and solvents, ensure to observe without fail the respective safety instructions on the packages.
When dressing with a flame- use caution- danger of explosion near fuel and oil related components!
When work is being performed on the crane, ensure that the switches and levers cannot be operated by accident or unknowingly.
Ensure that no one is in the danger Zone.

Maintenance instructions

Check the control panels for external damage and firm seating.
Damaged components must be replaced immediately.

Clean the control panels with a suitable aid.
Ensure that water and other wet-cleaning agents cannot damage the sensitive electrical components.

Figure 'A'



Railway Crane
Maintenance Manual

Description
The crane has an electrically operated wiper system its front and roof wind screens.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane cannot be switched on and is secured against rolling.
In addition, a "Maintenance work" warning sign must be visibly affixed to both in and outside the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts-danger of getting burnt, crushed or drawn into the equipment!
When working with paint and solvents, ensure to observe without with out fail the respective safety instructions on the packages.
When dressing with a flame- use caution- danger of explosion near fuel and oil related components!
When work is being performed on the crane, ensure that the switches and levers cannot be operated by accident or unknowingly.
Ensure that no one is in the danger Zone.

Maintenance instructions
Check the entire system for external damage and firm seating. In particular, ensure the wiper blades are in good condition. Any damaged or worn wiper blades must be replaced immediately.
Check the system for proper functioning.
Caution: - When the diesel engine is at a standstill, the screen wipers should only be switched on momentarily as other the batteries will run flat and the charged status will not be sufficient to start the diesel engine.

Railway Crane
Maintenance Manual

Fan **2.7.4**

P-1/1

Description
The fans built into the cab rear wall at the top serve to suction off and intake the cab air.

SAFETY INSTRUCTIONS

Before maintenance work is performed, it must be ensured that the crane can not be switched on and secured against rolling.
In addition, a "maintenance Work" warning sign must be visibly affixed to both in and out side the cab.
Remove ignition key and battery main switch and secure against any unauthorised start.
The crane must not be in the way of other vehicles.
Ensure that no one is near hot or moving parts- danger getting burnt, crushed, or drawn into the equipment.
The crane must not be operated in enclosed areas without an exhaust fumes discharges.
When work is being performed on the crane; ensure that the switches levers can not be operated by accident or unknowingly. Ensure that no one is in the danger zone.

Maintenance Instructions
Check the fans and their cover grates for external damage and firm seating.

Screw off the vent grates when the fans are switched off and clean with a suitable aid.

Activate the respective switch on the control panel and test whether both fans run properly.

Caution! When the diesel engine is stationary, the fans should run only shortly as otherwise the battery will run flat and the charging rate will not be sufficient to start the diesel engine.

Description

There are various pieces of additional equipment on the crane, in particular, in the cab. Nevertheless, they do not serve to affect any crane functions directly, but are required for smooth- running and proper operation.

SAFETY INSTRUCTIONS

When work is being performed on the crane, ensure that the switches and levers cannot be operated by accident on unknowingly. Ensure that no one is in the danger zone!

Maintenance instructions

Check the entire cab equipment for proper functioning.
Any damaged parts must be repaired or replaced.

Caution- Remember that fire extinguishers and first aid kits, etc. have expiry dates. Then they must be serviced or replaced accordingly!